

attached DASD in Fig 2; and reference characters "70" and "72" in Fig. 3 both being used to designate entries in a data structure. Furthermore, claims 1-2, 9-16, and 20-29 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,644,786 to Gallagher et al. in view of Applicants' admitted prior art; and claims 3-8, and 17-19 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Gallagher et al. and Applicants' admitted prior art, and in further view of U.S. Patent No. 5,931,912 to Wu et al.

Applicants respectfully traverse the Examiner's rejections to the extent that they are maintained.

As an initial matter, Applicants wish to thank the Examiner for his suggestions regarding several reference numbers in Figs. 2 and 3. The Examiner will note that Applicants have submitted proposed drawing corrections based upon the Examiner's suggestions. Formal drawings incorporating these corrections have also been submitted herewith under separate cover. Withdrawal of the objection to the drawings is therefore respectfully requested.

Now turning the subject Office Action, and specifically to the rejection of independent claim 1, this claim generally recites a method of processing access requests for a direct access storage device (DASD) such as a disk drive, where each access request is associated with a requester and a position on the DASD. The method includes sorting at least a subset of a plurality of access requests directed to the DASD based upon the requesters associated therewith to generate a first ordered set of access requests, sorting at least a subset of the access requests in the first ordered set of access requests based upon the positions associated therewith to generate a second ordered set of access requests, and issuing each of the access requests in the second ordered set of access requests in sequence to the DASD.

As such, claim 1 incorporates, in part, the concept of sorting access requests directed to a DASD based upon both the requesters and the DASD positions associated with such access requests.

The Examiner rejects claim 1 as being obvious over Gallagher et al. in view of Applicants' Admitted Prior Art (AAPA). A *prima facie* showing of obviousness, however, requires that the Examiner establish that the differences between a claimed invention and the prior art "are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art." 35 U.S.C. §103(a). Moreover, such a showing requires objective evidence of the suggestion, teaching or motivation to combine prior art references, as "[c]ombining prior art references without evidence of such a suggestion, teaching or motivation simply takes the inventor's disclosure as a blueprint for piecing together the prior art to defeat patentability -- the essence of hindsight." In re Dembiczak, 50 U.S.P.Q. 2d 1614, 1617 (Fed. Cir. 1999).

As described at page 4 of the Application, Applicants' claimed invention focuses on a novel scheduling algorithm that has been referred to in the Application as a "fair elevator" algorithm. In doing so, both the requesters (e.g., the tasks, programs, users, etc. that may issue requests to a shared resource such as a DASD), as well as the positions on the DASD (e.g., as identified by track, sector, address, cylinder, etc.), that are associated with pending access requests, are used to sort those access requests for submission to the DASD.

As is also noted in the Application, Applicants' claimed "fair elevator" algorithm incorporates aspects of two conventional algorithms, referred to in the art as the "fair" algorithm and the "elevator" algorithm. The "fair" algorithm focuses on maximizing multitasking performance in a data processing system, i.e., to ensure that multiple requesters are able to proceed at a reasonable rate when those requesters are accessing the same shared resource. The "elevator" algorithm, on the other hand, focuses on the performance of the DASD itself, by minimizing seek times through the ordered arrangement of requests based upon DASD position.

However, Applicants have found that, while each algorithm individually can benefit system performance, each algorithm is subject to certain drawbacks that mitigate the performance benefits obtainable thereby. In particular, as described at pages 1 and 2

of the Application, the "fair" algorithm can suffer from inefficient DASD performance due to the need for the DASD to jump around to access data stored at different positions when different requesters are accessing data at different regions of the DASD. Likewise, the "elevator" algorithm can cause certain requesters to become stalled if one particular requester issues many requests to the same general region on a DASD.

While the "fair" algorithm looks only at the requesters associated with access requests, and the "elevator" algorithm looks only at the DASD positions associated with access requests, Applicants' claimed invention looks at both the requesters and the DASD positions. By doing so, both multitasking performance from the perspective of the data processing system, and DASD performance from the perspective of a shared resource (i.e., a DASD) can each be improved without the attendant negative impact on the other.

In rejecting claim 1, the Examiner has correctly noted the conventionality of the "fair" and "elevator" algorithms individually. However, the Examiner's rejection is deficient in that the Examiner has failed to establish that it would have been obvious to combine these algorithms in the specific manner recited in claim 1, where access requests are sorted based upon both the requesters and the DASD positions associated with such access requests.

To establish a *prima facie* case of obviousness as to claim 1, it is the Examiner's burden to provide objective evidence of a suggestion or motivation in the art to combine the known "fair" and "elevator" algorithms in the specific manner recited in claim 1. The Examiner has failed to do so in this case, and as such, the rejection is based substantially on hindsight, and should be withdrawn.

Specifically, Gallagher et al., as noted by the Examiner, discusses only an "elevator" algorithm. Moreover, there is no disclosure or suggestion in the reference of the desirability of "fairness" with respect to multiple requesters of a shared resource. While the Examiner correctly notes that Gallagher et al. teaches the use of two queues to sort requests, neither of the queues is used to sort based upon anything other than position-related criteria. Gallagher et al. therefore cannot be relied upon to provide the required objective evidence of motivation.

Likewise, the AAPA fails to provided the necessary evidence of motivation. Applicants have made no admission in the Application as to the conventionality of combining the "fair" and "elevator" algorithms together. Indeed, Applicants' disclosure as a whole argues that it is the combination of these two techniques into the claimed "fair elevator" algorithm that substantially contributes to distinguishing the invention from the prior art. Any attempt to read such motivation into the Application would expressly run counter to Applicants' disclosure as a whole, and therefore would not be proper.

As an additional matter, Applicants respectfully submit that reliance on Applicants' disclosure to provide the required evidence of the suggestion, teaching or motivation to modify Gallagher et al. would be inappropriate as a matter of law, as such reliance would necessarily constitute the use of Applicants' disclosure as a "blueprint" for modifying the prior art - the essence of hindsight-based analysis. Applicants respectfully submit that the Examiner must be able to cite some evidence of suggestion or motivation that is independent of Applicants' disclosure to support an obviousness rejection.

Given that neither Gallagher et al., nor the AAPA, can be relied upon to provide the required evidence of motivation, the Examiner must be able to point to some other teaching in the prior art that suggests the desirability of combining "fairness" techniques (relying on the requesters associated with access requests) with "elevators" techniques (relying on the DASD positions associated with access requests) in a common algorithm. In this case, the Examiner has not pointed to, nor could the Examiner point to, any other teaching in the prior art that suggests this combination.

Absent a citation of clear, objective evidence as to the desirability of combining fairness and elevator techniques in a common algorithm, the Examiner's rejection amounts to nothing more than hindsight-based reasoning. Applicants therefore respectfully submit that the Examiner has failed to raise a *prima facie* case of obviousness as to claim 1. Reconsideration and allowance of claim 1, as well as of claims 2-8 which depend therefrom, are therefore respectfully requested.

Next, with respect to independent claims 9, 12, 13, 23, and 28, each of these claims recites to varying extents the concept of relying on both the DASD positions and

the requesters associated with access requests to schedule the submission of access requests to a DASD. As discussed above in connection with claim 1, the prior art of record does not disclose or suggest the use of both the positions and the requesters associated with access requests in a scheduling algorithm. Accordingly, the Examiner's rejection of these claims is deficient for the same reasons as presented above for claim 1. Reconsideration and allowance of each of independent claims 9, 12, 13, 23, and 28, as well as of claims 10-11, 14-22, 24-27 and 29 which depend therefrom, are therefore respectfully requested.

In summary, Applicants respectfully submit that all pending claims are novel and non-obvious over the prior art of record. Reconsideration and allowance of all pending claims are therefore respectfully requested. If the Examiner has any questions regarding the foregoing, or which might otherwise further this case onto allowance, the Examiner may contact the undersigned at (513) 241-2324. Moreover, if any other charges or credits are necessary to complete this communication, please apply them to Deposit Account 23-3000.

Respectfully submitted,

10 DEC 2002

Date



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Version with Markings to Show Changes Made

Drawings

The Drawings have been amended per the attached sheets, with the proposed changes circled in red.

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1/4

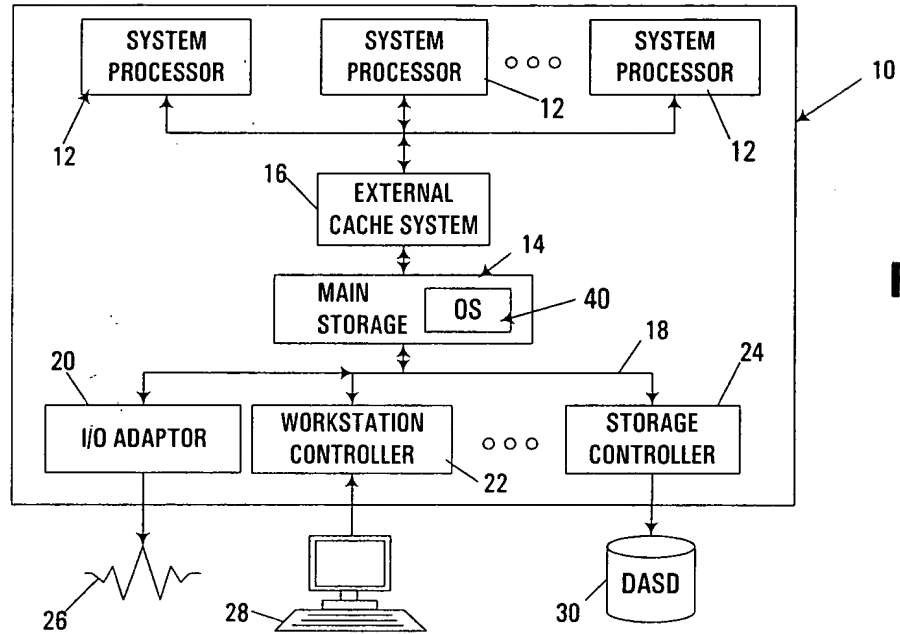


FIG. 1

OK
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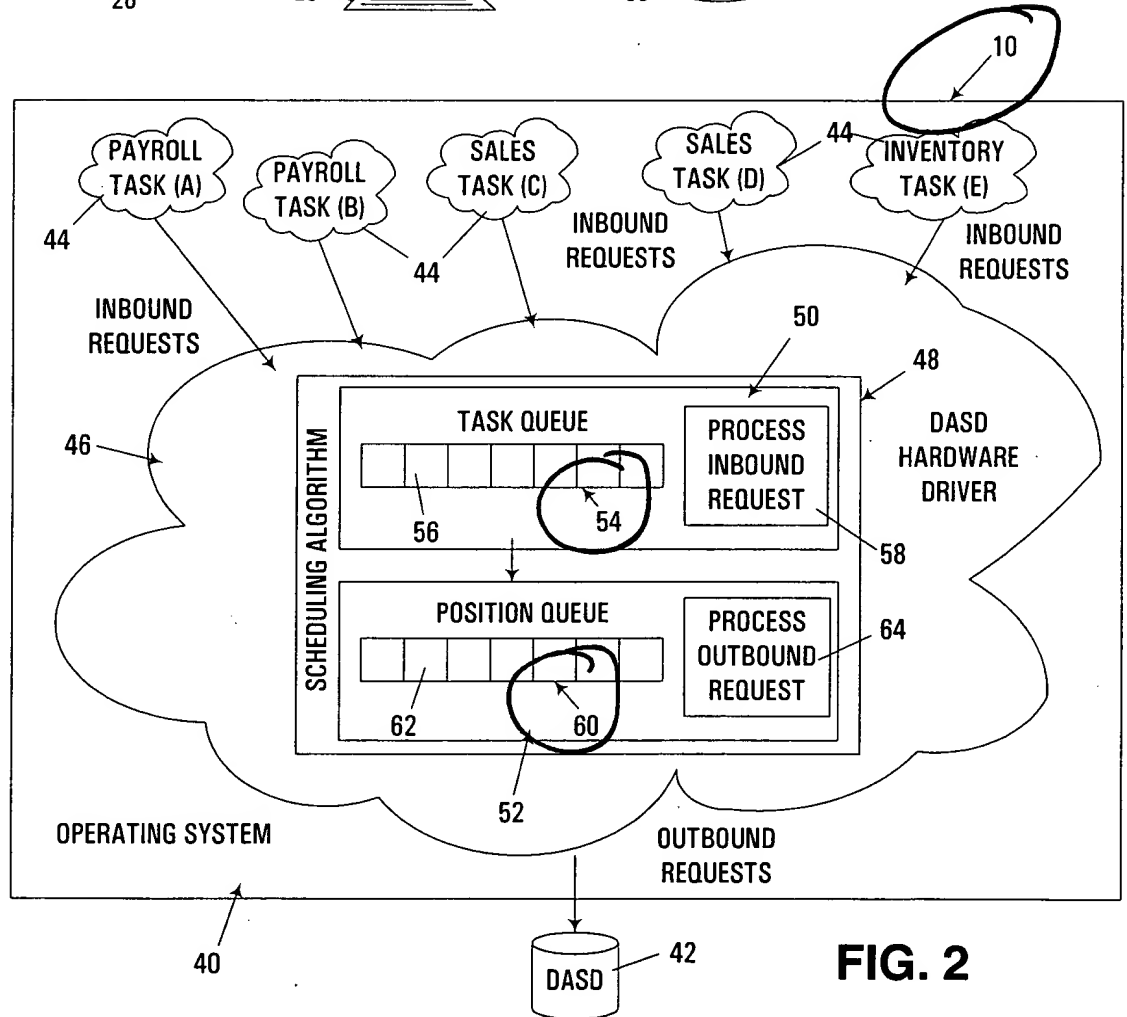


FIG. 2

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2/4

